The Monetary-Fiscal Policy Mix: Perspectives from the U.S.

PRELIMINARY

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Abstract

This paper discusses the U.S. perspective on the monetary-fiscal policy mix, and the interactions between monetary and fiscal policy more broadly. It identifies three sets of issues that have been modeled in the theoretical literature: composition effects, the implications of fiscal solvency, and problems stemming from coordination failures and strategic interactions. Empirical work presented in the paper indicates that fiscal and monetary policy appear to have had effects on the composition of output, but solvency, coordination and strategic issues have been neither significant nor endemic. In addition, there is no evidence of a systematic Federal Reserve response to fiscal policy, beyond that which would be implied by the impact of fiscal policy on future GDP growth.

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1 Introduction

The policy "mix" — the combination of fiscal and monetary policies in place — has varied a great deal in the U.S. over the past 40 years. Scant coordination between these policies has been apparent over this period, however: with fiscal and monetary policies set by independent authorities (fiscal policy by the government, and monetary policy by the independent Federal Reserve), the policy mix has been determined as much by accident as by design. Nordhaus (1994), among others, has criticized this lack of coordination, on the grounds that it can lead to a suboptimal mix of policies.[1]

This paper discusses the U.S. perspective on the policy mix, and the interactions between fiscal and monetary policy more broadly. The goal is not to break any new theoretical ground, but rather to synthesize the existing literature on the topic, and to assess its relevance to the U.S. experience.

To this end, the first section of the paper provides a selective survey of the theoretical literature on monetary-fiscal policy interactions. Three sets of theoretical issues are identified: composition effects, considerations having to do with the government's intertemporal budget balance, and problems stemming from coordination failures and strategic interactions. The second section gives a brief summary of major developments in monetary and fiscal policy over the past 40 years. The third section discusses the U.S. experience in light of the theoretical issues, and reports the results of some empirical work evaluating the impact of the fiscal policy stance on monetary policy. Overall conclusions are offered in the final section.

[1]Nordhaus invokes an anatomical analogy to make the point: "No one would dream of designing the human anatomy by disconnecting the controls of the left and right sides of the body. Yet, for the most important economic controls in a modern economy, monetary and fiscal policy, economists today generally endorse the separation of powers as a way of optimizing noninflationary growth."

2 What makes a policy mix optimal?

A useful way to begin is to ask what considerations would make any particular mix between monetary and fiscal policy better or worse than any other. Viewed within the framework of the short-run IS/LM analysis familiar to undergraduates, the question is rather trivial: the policy mix *per se* is irrelevant. All that matters is the overall level of aggregate demand, and this can be achieved either through fiscal policy, through monetary policy, or through some combination of the two.[2] There is, of course, some question as to whether fiscal policy or monetary policy would be more *effective* as a stabilization tool. In the U.S., the conventional view is that fiscal policy (or at least the discretionary component) is simply not sufficiently agile to be effective in a stabilization role.[3] At the same time, the fiscal stance is heavily influenced by exogenous military or political considerations. Thus, the role of macroeconomic stabilization is largely left to the Federal Reserve; fiscal policy represents merely another demand shock to be countered by monetary policy.[4]

Clearly, modern macroeconomic theory has progressed well beyond the IS/LM analysis of undergraduate textbooks. Nonetheless, that framework's basic implication with regard to fiscal policy appears to carry over to forward-looking New Keynesian models: the fiscal stance is relevant to monetary policy only to the extent that it represents a demand shock, to be offset by the monetary authority. Over a longer horizon, as pointed out by Taylor (1995) a fiscal consolidation will result in a lower equilibrium real interest rate; in such an environment, keeping inflation near an (unchanged) target will require a reduction in nominal interest rates. Fiscal shifts will therefore require

[2]This has sometimes been labeled the "common funnel" assumption: the government could pour either fiscal or monetary stimulus into one end of the funnel, and faster GDP growth would come out the other end.

[3]This view is reflected in Dornbush and Fischer's textbook (1990), which states: "In the case of fiscal policy, the long inside lags make discretionary fine tuning virtually impossible…" (page 462).

[4]This logic is typified by the analysis of Brimmer and Sinai (1986), who calculate the contractionary impact on aggregate demand of the Gramm-Rudman-Hollings legislation (the Balanced Budget and Emergency Deficit Control Act of 1985), and the size of the interest rate cut required to offset its effects.

monetary policy adjustments, but the mix between fiscal and monetary policy remains irrelevant to macroeconomic outcomes.

The irrelevance of the policy mix vanishes in more sophisticated analyses, however. There are three distinct, but interrelated issues: first, the extent to which the mix affects the composition of final demand and output; second, whether fiscal policy could undermine the monetary authority's control of inflation; and third, the implications of strategic interactions between monetary and fiscal authorities. This section of the paper discusses these three sets of issues, and provides a selective review of the literature in which they are developed.

2.1 Composition effects

Perhaps the most obvious impact of the fiscal-monetary policy mix on economic outcomes is through its effect on the composition of output. The mechanism is straightforward: to the extent that the mix influences the level of real interest rates, the level of investment vis à vis government spending will be affected. In addition, movements in domestic interest rates will have implications for the exchange rate, which will in turn affect export performance.

Formalizing these effects is straightforward, requiring little more than the standard IS/LM analysis familiar to undergraduates.[5] In a static, closed-economy classical model *not* characterized by Ricardian equivalence, an increase in real government expenditures requires some combination of increased saving and decreased investment ("crowding out") in order to restore equilibrium between saving and investment. The strength of the crowding-out effect will, of course, depend on a variety of factors: the magnitude of the saving response, access to foreign sources of funds, and the degree of substitutability between bonds and capital in investors' portfolios.[6] By reducing the

[5] Dornbusch and Fischer (1990), for example, discuss the issue at length (pages 157-66, and 194–211). A more rigorous analysis would, of course, require a fully-articulated two-sector model.

[6] Friedman (1978) shows that under certain assumptions about the characteristics of asset demand, an increase in government expenditure can actually "crowd in" private investment.

real interest rate, expansionary monetary policy can — at least in the short-run — offset some of the crowding out, although presumably at a cost of higher inflation.

Lacking an explicit welfare criterion, the 1970s-vintage models used to analyze these composition effects cannot address the question of whether any particular policy mix is "optimal." The assumption implicit in most of the analyses, however, is that due to various pre-existing distortions the U.S. capital stock was already below the "modified golden rule," and hence any policy that reduced investment would move the economy even farther from the optimum.

Tobin (1986) goes beyond the usual static (or comparative steady state) analysis, and analyzes the implications of crowding out for the economy's dynamics. His model is a simple growth model, in which households have a choice of holding government debt or physical capital. The government's budget obeys a flow constraint, so that the current deficit is financed either by seignorage or by borrowing. Surprisingly, given its conventional structure, Tobin's model exhibits a disturbing tendency for the capital stock to converge to zero, as the government's financing requirements eventually completely crowd out private investment. One source of this instability is the property that as the capital stock shrinks, the real interest rate rises, which in turn increases the government's debt burden. Increasing the monetary authority's target inflation can postpone the economy's collapse, but (at least for the parameters considered by Tobin) cannot prevent it — largely because the revenues from seignorage are relatively modest.

Clearly, Tobin's doomsday scenario depends on a number of key assumptions. One is the absence of future surpluses sufficient to offset (in present value terms) current deficits.[7] Another important assumption is the exclusion of capital flows from abroad. With foreign capital available to finance government expenditures, deficits would have smaller impact on interest rates, and the crowding-out effect would be proportionally

[7] In Leeper's (1991) terminology (see section 2.2, below), fiscal policy would be described as non-Ricardian, or "active." The lack of a well-behaved equilibrium in Tobin's model with an exogenous inflation target foreshadows Leeper's result with active monetary and fiscal policies.

smaller. In fact, Ribe and Beeman (1986) estimate that opening the economy to capital flows reduced the crowding-out effect in the U.S. in the 1980s by as much as two-thirds, relative to the closed-economy counterfactual.

A related dimension concerns the effect of the fiscal-monetary policy mix on the current account. In the familiar Mundell-Fleming framework, the logic of this linkage is clear: in a closed-economy setting, a fiscal expansion would tend to make the domestic interest rate rise, and restore equilibrium between saving and investment. The interest rate differential will induce an inflow of foreign capital, financing some (or *all*, in the limit of perfect capital mobility) of the expenditures, limiting the crowding out. But the capital inflows imply a current account deficit brought on by a stronger currency, displacing net exports' contribution to GDP. This effect was the focus of a large literature in the 1980s in the U.S., and indeed this was the conventional explanation for "twin deficits" of that period. More recently, Cohen and Loisel (2001), among others, have suggested that the opposite problem — tight fiscal policy and loose monetary policy — was responsible for the weakness of the Euro immediately after its launch.

2.2 Implications of the government budget constraint

A second set of monetary-fiscal interactions stems from the implications of the government's intertemporal (present value) budget constraint. The insight here is that every fiscal policy action involving an increase in the *current* budget deficit must be financed somehow: either through an increase in *future* tax revenues, or through an erosion in the value of nominally-denominated government liabilities, such as money. This may involve overtly resorting to seignorage to finance the deficit, as in the "unpleasant monetarist arithmetic" of Sargent and Wallace (1981). But even without an explicit monetary response, the intertemporal fiscal balance could be restored through an increase in the price level, and reduced the value of outstanding government liabilities. Models in which this intertemporal government budget constraint determines the price

level collectively fall under the rubric of the "Fiscal Theory of the Price Level" (FTPL), expounded by Woodford (2001), and elsewhere.[8]

One model derived from the Sargent-Wallace insight that explores the effect of fiscal conditions on optimal monetary policy is that of Persson et al. (1987). In their setup, the sequence of government expenditures, $\{g_t\}_0^\infty$ is given exogenously. The problem faced by the government is to choose the optimal combination of (distortionary) wage taxes, seignorage, and debt issuance to finance those expenditures and satisfy the intertemporal budget constraint, given an initial level and maturity structure of nominal debt obligations.

The model exhibits an interesting form of time inconsistency, due to the fact that the distortionary nature of taxes creates for each successive government an incentive to engage in a surprise inflation, thereby reducing the real value of its inherited nominal obligations. So long as the inflation comes as a surprise, it is nondistortionary — unlike alternative, wage taxes.[9] But in equilibrium, of course, the public will recognize this temptation and come to expect the inflation. Hence the time-consistent discretionary outcome will involve higher-than-optimal inflation, and with it, below-optimal holdings of real money balances.[10]

Leeper (1991) also explores the way in which the government's intertemporal budget constraint affects the conduct of monetary policy, albeit in a very different framework from that of Persson et al. Leeper's focus is on the interaction of the *rules* characterizing the behavior of the monetary and fiscal authorities, however, rather than on the optimal tax problem, and the incentives it creates for monetary policy.

The key distinction drawn by Leeper is between "active" and "passive" policies.

[8]The legitimacy of using the intertemporal budget constraint in this way has been vigorously challenged by Buiter (2002), on the grounds that the constraint represents an identity that must hold even outside of equilibrium, rather than a condition to be used to characterize equilibria.

[9]This is nothing more than another manifestation of the familiar capital levy problem.

[10]The model also contains a second source of time inconsistency, one which gives the government an incentive to rearrange the time path of tax and seignorage finance. It turns out that these two sources of time inconsistency can be eliminated by constraining the government's *net* nominal liabilities to zero, and through an appropriate choice of indexed debt and nominal debt of differing maturities.

The difference has to do with whether the policy is constrained to ensure the satisfaction of the government's intertemporal budget constraint: the "passive" (or "Ricardian") policymaker is constrained by this requirement, while the "active" one is not. In his model, for example, a passive fiscal policy is one in which the authority responds to higher debt levels with tax increases sufficient to balance the budget (intertemporally). An active fiscal policy, on the other hand, would determine tax and spending levels without regard for any intertemporal budget considerations. Similarly, an active monetary policy is one that pursued its (inflation) target independent of any fiscal considerations; a passive policy, on the other hand, would set interest rates in such a way as to ensure intertemporal fiscal balance.[11]

In Leeper's model, it turns out that the active versus passive distinction determines whether the roots of the solution's two difference equations fall inside or outside the unit circle. Hence, in order for there to be a unique equilibrium, one policymaker must be passive, while the other one is active. Not surprisingly, the regime with an active monetary policy and a passive fiscal policy allows the monetary authority to retain control over inflation and nominal interest rates; neither depends in any way on fiscal policy. But at a deeper level, this property depends on the fact that the *rule* governing fiscal policy guarantees fiscal solvency. The solution is very different under an active fiscal policy and a passive monetary policy, of course: the key difference is that in this case, expansionary fiscal shocks raise the price level and money growth, essentially because the monetary authority is forced to accommodate those shocks' effects on the solvency condition.[12]

[11] A situation of active fiscal policy and passive fiscal policy might be described as one of "fiscal dominance."

[12] In Leeper's model the increase in the growth rate of money is as much an *effect* of the price increase as it is a cause. Thus, the model represents one of the first to display the features associated with the fiscal theory of the price level.

2.3 Monetary-fiscal coordination, and the lack thereof

A third set of considerations arises in models with distinct monetary and fiscal authorities, the possibility of noncooperative behavior between the two. Like those emphasizing the government's intertemporal budget constraint, discussed above, the behavior of the fiscal authority can affect the monetary authority's ability to attain its inflation objective. But unlike the models discussed above, the underlying source of conflict in these situations stems from differences between the authorities' goals. One source of tension stems from differences in inflation and output targets, and/and the weights on those targets. Another source is the monetary authority's presumed neglect of any costs associated with tax collection or spending.[13]

It is precisely this sort of conflict that is the focus of a recent paper by Dixit and Lambertini (2002). That paper extends the basic framework of Barro and Gordon (1983) to model the strategic interaction between fiscal and monetary authorities with different loss functions. Specifically, output is assumed to depend on both fiscal policy, x and the inflation "surprise" $\pi - \pi^e$,

$$y = \bar{y} + ax + b(\pi - \pi^e) \ , \tag{1}$$

and fiscal policy is also assumed to affect inflation

$$\pi = \pi_0 + cx \ . \tag{2}$$

The monetary authority is assumed to have direct control over inflation. The means by which the fiscal expenditure is financed are not explicitly considered.

The conflict arises because the fiscal authority's loss function (which also represents the social loss function),

$$L_F = \frac{1}{2}\left[(\pi - \pi_F)^2 - \theta_F(y - y_F)^2 + 2\delta x\right] \tag{3}$$

[13] Huang and Padilla (2002) consider a scenario of a noncooperative game between fiscal and monetary authorities, in which the monetary authority's incentives are given by a Walsh contract. In this case, the fiscal authority has an incentive to increase taxes in order to reduce payments to the central bank, and finance additional discretionary expenditure. No country currently makes use of such a contract, however, so their analysis is at this point of mostly academic interest.

differs from the monetary authority's,

$$L_M = \frac{1}{2}\left[(\pi - \pi_M)^2 - \theta_M(y - y_M)^2\right] \ ; \tag{4}$$

in particular, it is assumed that $\pi_M < \pi_F$, $\theta_M < \theta_F$, and/or $y_M < y_F$ (reflecting the central bank's conservatism, à la Rogoff (1985)). The δx term in the fiscal/social loss function reflects the deadweight losses associated with taxes and/or spending. A very similar conflict is modeled by Nordhaus (1994), except in his model the fiscal authority is assumed to *like* deficits, which would make $\delta > 0$.

Given Dixit and Lambertini's setup, it is no surprise that the non-cooperative Nash equilibrium generally involves higher levels of inflation and lower levels of output than those associated with the best feasible allocation (which is itself a second-best outcome, because of the distortion introduced by fiscal policy). The explanation for this follows directly from the assumed nature of the fiscal/monetary conflict: the monetary authority aims to reduce output and inflation below the fiscal authority's ideals, while fiscal policy aims to raise output and inflation above the monetary authority's ideals. The result is an inflationary fiscal policy, which is (partially) offset by an overly-contractionary monetary policy.[14] Only with $c = 0$ (so that fiscal policy has no effect on inflation) and with an appropriate degree of "conservatism" on the part of the central bank can the best feasible allocation be obtained noncooperatively. Moreover, Dixit and Lambertini go on to show that precommitment on the part of the monetary authority doesn't solve the problem; the value of the commitment would be completely negated by discretionary fiscal policy actions (hence the paper title). Nordhaus (1994) obtains a very similar result, with high levels of deficit spending and contractionary monetary policy as the noncooperative outcome.

The novel paper of Eggertsson (2002) turns the usual "inflation bias" result of the

[14] Paradoxically, in the Dixit-Lambertini setup, this involves a fiscal policy which is insufficiently *expansionary*. The reason for this is their counterintuitive assumption that $c < 0$, i.e., that fiscal expansions reduce inflation. The authors claim that the algebra works for other parameter configurations, but the characteristics of the equilibria with $c > 0$ are not reported.

time consistency literature on its head, showing that in a liquidity trap situation, independent, discretionary monetary policy may result in a *deflationary* bias, which would hamper the escape from the trap. In this case, Eggertsson shows that putting the central bank (or at least its inflation target) under the control of the fiscal authority can reduce or eliminate this bias, by internalizing the effects of monetary policy on tax collection costs.

Eggertsson's setup resembles that of Dixit and Lambertini (2002) in that the objective functions of the monetary and fiscal authorities differ in crucial ways. Specifically, the fiscal authority is assumed to care only about tax collection costs:

$$L_F = E_0 \left(\sum_{t=0}^{\infty} \beta^t \tau_t^2 \right) \tag{5}$$

where τ is the level of (lump-sum) taxes. The monetary authority has the conventional loss function,

$$L_M = E_0 \sum_{t=0}^{\infty} \beta^t \left[\pi_t^2 + \lambda_y (y_t - \bar{y_t})^2 \right] \ , \tag{6}$$

where $\bar{y_t}$ is the (possibly time-varying) natural rate of output. The social loss function is an appropriately weighted average of the two policymakers',

$$L_S = E_0 \sum_{t=0}^{\infty} \beta^t \left[\pi_t^2 + \lambda_y (y_t - \bar{y_t})^2 + \lambda_\tau \tau_t \right] \tag{7}$$

These can be interpreted as multiperiod, stochastic generalizations of the loss functions in Dixit and Lambertini (2002). The key distinction, however, is that the fiscal authority is concerned only with the tax rate, while the monetary authority is concerned exclusively with output and inflation. (The target inflation rate is assumed to be zero.) The central bank faces a forward-looking IS curve, which allows it to influence the level of output by manipulating nominal interest rates. The fiscal authority, meanwhile, takes as given an exogenous (constant) stream of government purchases.

In the non-cooperative solution, in which each authority minimizes its own loss function, and in which fiscal policy is "Ricardian" (or "passive" in Leeper's (1991) terminology) fiscal policy is completely irrelevant, having no effect on macroeconomic

outcomes.[15] The monetary authority is "active," in the sense that it pursues its macroeconomic objectives with no regard for its effects on the government's budget constraint. Because fiscal policy has no effects on macroeconomic outcomes, unlike in Dixit and Lambertini, there are no interesting strategic interactions between the two authorities.

Interesting things happen in the model when there has been a contractionary shock that drives the "natural" rate of interest (i.e., the rate of interest consistent with the "natural" level of output) below zero. With the nominal interest rate bounded at zero, the optimal monetary policy would be to generate enough inflation so that the negative real rate is realized. However with a zero inflation target (and in the absence of a precommitment device), when it comes time to deliver that inflation, the central bank will renege. Agents in the private sector understand this, of course, and know that the promise of inflation is not credible. As a result, the real interest rate remains high, leaving output depressed.

Eggertsson's way out of this dilemma (short of precommitment) is to have the monetary and fiscal authorities cooperate, i.e., to jointly maximize (under discretion) the social objective function, equation 7. This could be achieved either by putting monetary policy (or at least the inflation target) under the control of the fiscal authority. Under this arrangement, the unified policymaker's optimization problem internalizes the effects of monetary policy on the tax collection costs, τ. Now, fiscal policy need not be strictly Ricardian: the optimal financing of the government's (exogenous) expenditures now involves accumulating nominal debt, and then reducing the real value of that debt through higher inflation.[16] Thus the vice of inflationary finance that characterized the Persson et al. (1987) model becomes a virtue in a deflationary environment.

[15]The methodological reason Eggertsson assumes a Ricardian fiscal policy is to focus exclusively on the effects of deficit finance *per se*, rather than on the effects of real expenditures. This assumption severely limits the potential role for fiscal policy, thereby isolating the effects of government debt on the government's incentives.

[16]The inflation is not a result of seignorage, which is ignored in Eggertsson's model. Instead, the price change is determined directly by the government's solvency condition, as in the fiscal theory of the price level.

3 The policy mix since 1960: a short narrative

In order to understand which of these theoretical considerations is relevant to the U.S. experience, it will be useful to begin with a brief narrative history of the major shifts in fiscal and monetary policy over the past four decades. The section covers key fiscal milestones first, followed by a summary of some of the major shifts in monetary policy. The following section will offer some interpretations of these developments in light of the economic theory discussed above.

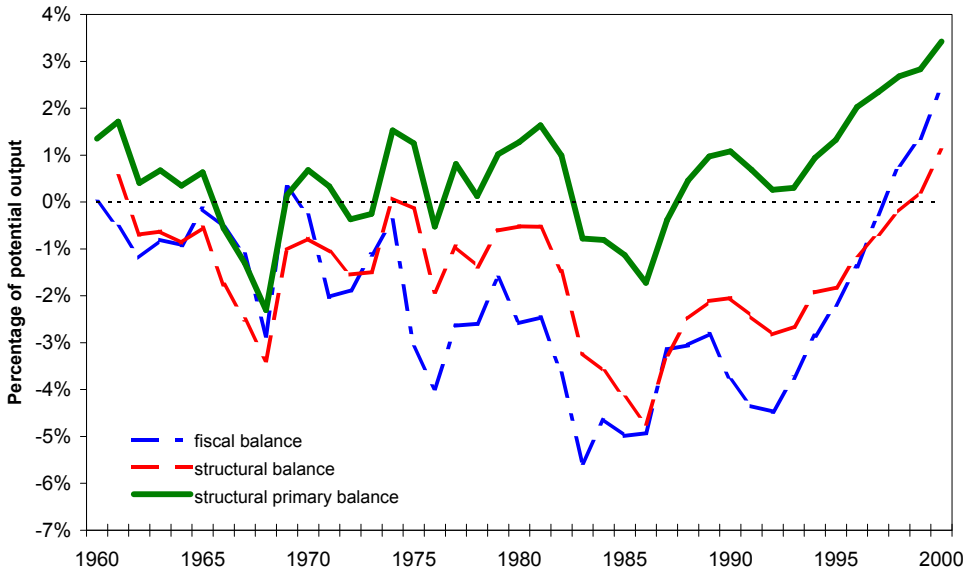
3.1 Fiscal milestones

One informative gauge of the stance of fiscal policy is by way of the federal budget deficit, shown in figure 1.[17] The figure shows the unadjusted fiscal balance, the "structural" or cyclically adjusted deficit (calculated by the Congressional Budget office), and the structural primary deficit (excluding net interest payments). All are expressed as a percentage of the CBO's estimate of potential GDP.

A few sustained, significant swings in the structural primary balance stand out from figure 1. The first such swing is the major increase in the deficit from 1966 through 1968. Although there was an income tax cut in 1964, the bulk of the increase stems from an increase in federal expenditures: both on Vietnam war-related military spending, as well as a sharp increase in transfer payments associated with the Johnson-era "Great Society" programs. The net result was a deficit that exceeded 2 percent of potential GDP by 1968. In belated recognition of the increasingly worrisome fiscal situation, a one-year 10 percent personal income tax surcharge was passed in mid-1968, a sharp (if temporary) contractionary shift in fiscal policy. The 1968-69 tax surcharge (as well as the 1964 tax cut) show up quite clearly in a plot of personal tax (and non-tax) payments as a percentage of personal income, shown in figure 2.

[17] Unlike the federal government, states are generally constrained to run balanced operating budgets, although they can issue debt to finance capital expenditures.

Figure 1: Measures of the U.S. fiscal balance, 1960-2000

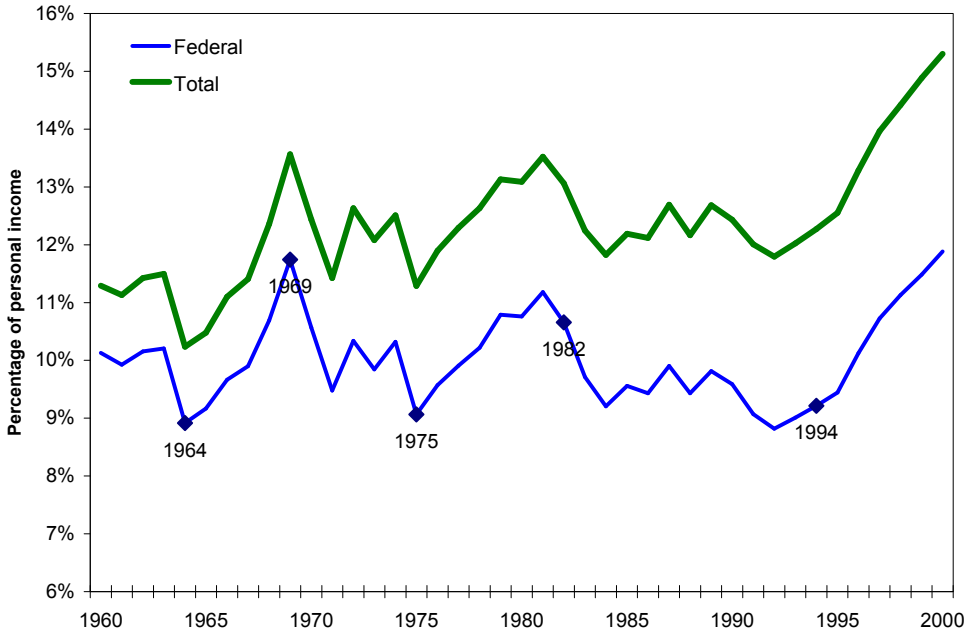


Source: Congressional Budget Office. Dates shown are fiscal years, which start on July 1 of the preceding calendar year for fiscal years through 1976, and start on October 1 of the preceding calendar year for fiscal years beginning with 1977.

The 1970s saw a general increase in tax revenues (due in part to inflation-induced "bracket creep,") and in government expenditures. There was little net effect on the overall fiscal stance, however, with the primary structural deficit generally fluctuating around zero. The only fiscal measure designed to move the stance one way or the other was the 1975 tax rebate. But because this was a temporary measure lasting only one quarter, it had no lasting effect on the deficit.

Probably the largest post-WWII shift in the fiscal stance came in 1981, with the Reagan-led tax cuts embodied in the Economic Recovery Tax Act of 1981. The centerpiece of the package was a phased reduction, beginning in 1982, in personal income tax rates; other key elements included indexation, and accelerated deprecation allowances. The impact on tax revenues was significant, and shows up clearly in the 1982–84 period in figure 2. Even with the adjustment for the effect of the 1981–82 recession, the primary structural deficit swelled to nearly 2 percent of potential GDP. The overall deficit was much larger, because of the costs of servicing the debt brought about by

Figure 2: Personal tax and non-tax payments as a share of personal income, 1960-2000



Source: National Income and Product Accounts. Dates shown are calendar years.

high interest rates.

Growing concerns about the magnitude of the deficits led to a series of efforts to impose fiscal rules intended to shrink the deficit.[18] The first of these, the Balanced Budget and Emergency Deficit Control Act of 1985 (Gramm-Rudman-Hollings I), placed limits on the projected budget deficit, and established a sequestration procedure to reduce spending when the limits were exceeded. The constraints imposed by this legislation did little to improve the fiscal balance, however. Somewhat more progress was made under the Balanced Budget and Emergency Deficit Control Reaffirmation Act of 1987 (Gramm-Rudman-Holings II), and the primary structural balance finally turned positive in 1988.

The Budget Enforcement Act of 1990 was intended to further increase fiscal dis-

[18] Peach (2001) provdes an excellent summary of these rules, and an assessment of their effectiveness. Peach argues that more readily-verifiable fiscal rules, such as debt limits, tend to be more effective than less-transparent measures.

cipline through the introduction of a "pay-as-you-go" (PAYGO) process for budget changes and more elaborate sequestration measures. But the Act ended up producing a more expansionary fiscal policy in the near term, as it allowed a large, one-time 6.6 percent increase in expenditures in fiscal year 1991. The push for fiscal discipline was renewed under the Clinton administration, in the form of the Omnibus Budget Reconciliation Act of 1993. Key elements of this measure included an increase in personal income tax rates for upper-income taxpayers, as well as spending caps and an extension of the PAYGO procedures. The result was a significant increase in revenues and the overall budget surplus beginning in 1994. (Rapid income growth and a favorable, demographically-driven social security balance also helped.)

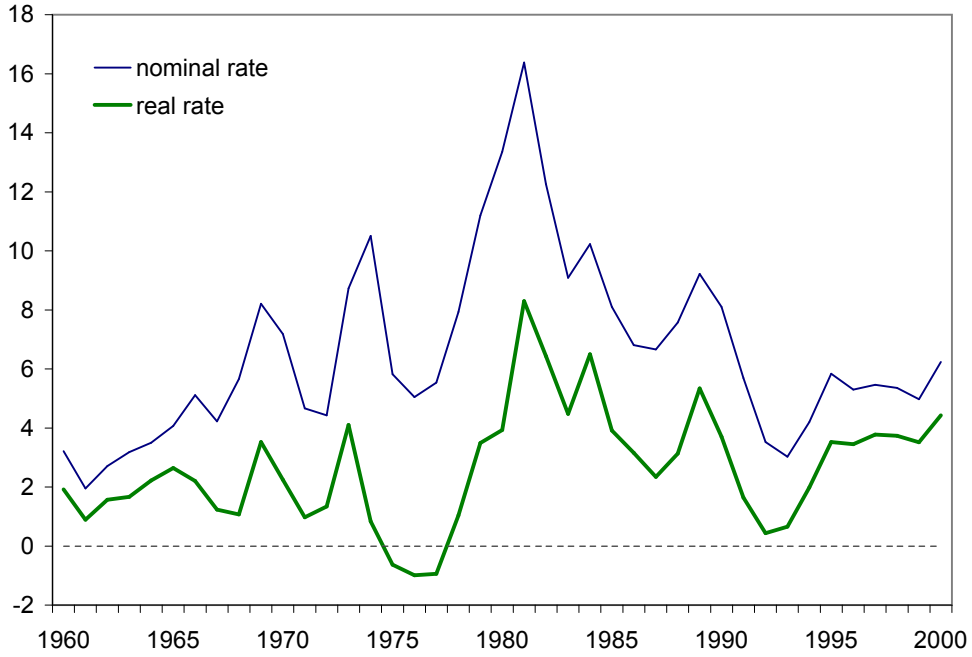
3.2 Monetary policy shifts

Figure 3 plots annual data on the Federal funds rate from 1960 to 2000, as a way of characterizing Federal policy over the period. The figure shows both the average nominal rate, and the real rate calculated as the nominal rate less year-over-year core inflation (measured by the personal consumption deflator, excluding food and energy). The Federal funds rate was not the operating instrument of U.S. monetary policy over the period, of course. Nonetheless, regardless of the operating procedure in use, the funds rate has been widely used as an informative gauge of the stance of monetary policy.[19] Clearly, there has been considerable variation in the stance of policy over the period, but a number of distinct, sustained contractionary and expansionary episodes stand out.

Responding to a rapidly expanding economy in the late 1960s, Fed policy tightened in 1969, resulting in an increase in the nominal Federal funds rate from 6.3 percent in January to 9.2 percent in August of that year. Inflation edged up only slightly over this period, however, and consequently Fed policy led to sharply higher real rates as

[19] See Bernanke and Blinder (1992), for example.

Figure 3: Nominal and real Federal funds rate, 1960-2000



Source: Federal Reserve System and author's calculations.

well. Policy was relaxed as the economy fell into recession, however, and rates were cut sharply in 1970, and remained relatively low for a period spanning most of 1971 and 1972. It was not until April of 1974 that the Fed, facing the inflationary effects of the 1973 oil shock, that the nominal and real funds rates rose appreciably, with the nominal rate reaching nearly 13 percent in July of that year. The combination of the oil shock and the monetary contraction led in turn to a sharp recession in 1974 and 1975.

Following the 1974–75 recession, the nominal Federal funds rate was again allowed to fall, and for the three years from 1975 through 1977 it remained (more or less) in the 5 percent range. But because inflation remained high, averaging 5 to 6 percent at an annual rate over this period, the *real* Fed funds rate was low, or even negative. A significant tightening of policy did not come until the second half of 1978, when the nominal funds rate rose 2.25 percent to roughly 10 percent. The tightening intensified with the Volcker-led policy shift in October 1979, which sent the nominal funds rate

soaring to over 17 percent. After a brief hiatus in mid-1980, the policy of very tight monetary policy resumed later that year, with nominal rates of nearly 20 percent. The real Fed funds rate peaked in 1981 at 8 percent. Monetary policy, measured by the real funds rate, remained relatively tight, even during the economic recovery, and the real rate remained high until 1986.

The next major shift in policy was not until the end of 1988, when the Fed steadily increased the "intended" Federal funds rate by about three percentage points, from roughly 6.75 to 9.75, with a real rate in the neighborhood of 5 percent. The 1991–92 recession followed more than a year later, during which the "intended" funds rate was reduced steadily to 3 percent by the end of 1992. With inflation running at roughly the same rate, this implied a real funds rate near zero. This expansionary policy was maintained for all of 1993 and into 1994, when the funds rate target was steadily raised, reaching 6 percent in early 1995; with inflation running between 2 and 2-1/2 percent, the real rate would have been in the 3 to 4 percent range. With some modest adjustments, this policy stance was largely maintained up through 2000.

4 The U.S. experience in light of the theory

This section addresses the question of which (if any) of the theoretical issues concerning the monetary-fiscal mix relevant to the U.S. experience since 1960. It begins by taking up the issues of fiscal discipline and policy coordination. Subsequent sections consider the effects of the mix on the composition of output, and the effect of the fiscal policy stance on the formulation of monetary policy.

4.1 Fiscal discipline and coordination

It is hard, if not impossible, to formulate formal statistical tests of the various hypotheses concerning fiscal discipline and policy coordination. Nonetheless, two broad conclusions can be drawn from an informal examination of monetary and fiscal devel-

opments since 1960. The first is that fiscal policy appears to have been reasonably well disciplined, in the sense that taxes or spending tended to adjust appropriately to major fiscal imbalances. The second is that instances of conflict between monetary and fiscal policy appear to have been relatively rare.

While it may not have been apparent at the time, fiscal discipline has led in the U.S. to a clear (if erratic) tendency for the primary balance to revert to zero through time. Bohn (1998) formalizes this notion, and confirms it using regression analysis. Specifically, he shows that once transitory and cyclically-sensitive government expenditures are controlled for, the primary fiscal balance has tended to respond positively to the debt-to-GDP ratio. Historically, tax changes have played a key role in restoring fiscal balance: many of the major the tax increases, such as those in 1968, 1992 and 1993, were to some extent driven by pressure to balance the budget. Conversely, the Reagan-era tax cuts followed a period of primary budget surpluses. Spending seems to have been generally less responsive to fiscal conditions, however. Only the Gramm-Rudman-Hollings spending cuts of the late 1980s come to mind as an example, and these were less than completely effective. And with the steady shrinkage of the discretionary portion of the Federal budget, the scope for balancing the budget with spending cuts is becoming ever more limited.

Thus, this reading of history, along with Bohn's evidence, seems more consistent with a "passive" fiscal policy (in Leeper's sense) than with an "active" one. If so, then the fact that the fiscal authority has more or less taken responsibility for balancing its intertemporal books has enabled the Federal Reserve to independently pursue its macroeconomic objectives. Consequently, the requirement of fiscal solvency appears to pose no real threat to Fed's pursuit of stable prices, and hence the issues raised by Leeper (1991) and Persson et al. (1987) are not major concerns for in the U.S.[20]

This conclusion does not, however, rule out the possibility of non-cooperative inter-

[20] Canzoneri et al. (2002) reach a similar conclusion, based on an analysis not unlike that of Bohn (1998).

Table 1: Major episodes in U.S. monetary and fiscal policy, 1960–2000

Monetary		Fiscal	
expansionary	contractionary	expansionary	contractionary
	1969	1966–68	1969
1971–72	1974		
1975–78	1979–85	1982–86	
	1989–90		
1992–93			1994–2000

actions between fiscal and monetary policy. However the narrative evidence suggests that perverse, non-cooperative outcomes that are a feature of the Nordhaus (1994) and Dixit-Lambertini (2002) models have not been the general rule in the U.S.

To get a sense whether this sort of conflict is widespread, it is useful to identify distinct periods during which monetary and fiscal policies were used in pursuit of conflicting objectives. A crude way to do this is to distill from the above discussion a rough classification of monetary and fiscal policy episodes. Four distinct episodes of contractionary monetary policy stand out: 1969, 1974, 1979–85, 1989–90, each representing a sustained increase in the real Fed funds rate.[21] The three periods of expansionary monetary policy with real rates below 1 percent: 1971–72, 1975–78, and 1992–93.

An analogous classification of fiscal regimes yields two distinctly expansionary regimes: the period of spending increases spanning 1966 through 1968, and the Reagan tax cuts, whose largest effects were felt from 1982 through 1986. Similarly, there are two periods that could be characterized as clearly contractionary: the 1969 tax surcharge, and the Clinton-era fiscal consolidation which began in 1994.

It is hard to discern any sort of systematic connection between these shifts in monetary and fiscal policies. Only in 1969 were monetary and fiscal policies synchronized,

[21] It is no coincidence that the beginning of each episode is associated with a policy shift identified by Romer and Romer (1989). The beginning of the 1979-85 episode arguably should be assigned to 1978, when the rate increases began (Romer and Romer identify a distinct contraction in 1978).

in the sense that both were contractionary at roughly the same time.[22] There is no evidence that these policies were explicitly coordinated, however; it is more likely that the policies were the outcomes of independent responses to the fiscal and macroeconomic situations.

By the same token, only in the early 1980s were monetary and fiscal policy clearly working at cross purposes. Nordhaus (1994) interprets this episode in particular as an outcome of the sort of noncooperative behavior described in his model. It seems unlikely that this outcome would have been brought on by a Reagan-administration preference for high inflation, however; nor is it clear that the tax cuts were intended to offset the effects of tight monetary policy. Other interpretations are possible, and perhaps more plausible: the administration's preference for smaller government, for example, and the notion that cutting taxes would eventually force a reduction in spending. The large budget deficits of the period may indeed have been one factor in the Federal Reserve's decision to maintain a relatively high level of real interest rates following the 1981–82 recession, but this does not necessarily imply a suboptimal outcome brought on by a coordination failure.

The 1994–2000 fiscal consolidation is another interesting period, and one which is sometimes viewed in terms of monetary and fiscal policy coordination. Indeed, as noted by Fischer (1994), Alan Greenspan's testimony before the Joint Economic Committee in 1991 can be interpreted in this light.[23] However even as the federal budget moved deeply into surplus, the real Federal funds rate fluctuated between 3 and 4 percent — somewhat above the average for the postwar era. Thus, a contractionary fiscal stance did not result in a clearly discernible shift towards more expansionary monetary policy. As discussed in section 4.3 below, this conclusion holds even accounting for the Fed's

[22]The tax surcharge actually came online in mid-1968, while Fed tightening did not begin until 1969. Thus, in this instance one could argue that fiscal policy moved more quickly than monetary policy.

[23]Greenspan stated: "If … Congress does enact a credible, long term, enforceable budget agreement, I would expect long-term interest rates to decline. In that context, I would presume that the Federal Reserve would move toward ease to accommodate those changes in the capital markets." [U.S. Joint Economic Committee (1991)].

normal response to changing economic conditions.

4.2 The policy mix and composition effects

The relevance of the policy mix for the composition of GDP is easier to address empirically, although the evidence is typically mixed. Regarding the impact on investment, the literature has tended to focus on the effects of fiscal policy on the real interest rates which are presumed to affect investment spending. Examples include Evans (1987) and Elmendorf (1996). On the question of net exports, most of the literature deals with the "twin deficits" of the 1980s. Rosensweig and Tallman (1993) is one example.

Rather than replicate those studies' detailed analysis, this paper takes a more descriptive approach to the question, and one that looks directly at the composition of output. The method is simply to tabulate the change in the investment and net export shares during the discrete monetary and fiscal policy episodes summarized above in table 1. The rationale is similar to that of Romer and Romer (1989): to the extent that the policy shifts are exogenous, any changes in the output mix ought to reflect the effects of policy, rather than changing macroeconomic conditions.

Table 2 shows the results from a least-squares regression of the quarterly change in the output mix measures (nominal investment as a share of nominal GDP, and nominal net exports as a share of nominal GDP, both expressed as a percentage) on dummies capturing the policy episodes in table 1. The coefficients on these dummies therefore represent the average change in the composition variable during the relevant episodes. One set of regressions contains only the four dummies, plus an intercept; another also contains the log difference of real GDP, as a simple control for the state of the economy. (The inclusion of real GDP growth has very little effect on the results.)

The results for monetary policy episodes are roughly in line with the predictions of elementary theory. Monetary expansions have been associated with statistically significant increases in investment share, as would have been predicted in the standard

Table 2: The effect of the policy mix on output composition

Dependent variable	Regressors: constant	policy dummies M+	M–	F+	F–	GDP growth	$\bar{R}^2$
Δ investment share	-0.07	0.32	-0.07	0.07	0.17		0.19
	(2.46)	(5.56)	(1.40)	(1.34)	(3.17)		
	-0.15	0.28	-0.03	0.03	0.15	0.02	0.27
	(4.43)	(4.95)	(0.61)	(0.62)	(2.98)	(4.49)	
Δ net export share	0.07	-0.19	-0.03	-0.15	-0.15		0.06
	(2.01)	(2.95)	(0.64)	(2.55)	(2.59)		
	0.09	-0.17	-0.05	-0.14	-0.14	-0.01	0.07
	(2.43)	(2.66)	(0.89)	(2.28)	(2.48)	(1.37)	

Notes: Numbers in parentheses are t-statistics. The M+ and M– dummy variables equal unity during the monetary expansions and contractions listed in table 1. Similarly, the F+ and F– dummy variables correspond to the periods of fiscal expansions and contractions in table 1. The dependent variables are expressed as percentages.

IS/LM analysis. But these monetary expansions are also associated with a decrease in net export share, which indicate that any effects of exchange rate depreciation are more than offset by an increase in import demand generated by rising GDP. Interestingly, symmetric effects of monetary contractions are not evident in this analysis.

The measured effects of fiscal policy on output composition are slightly more puzzling. Fiscal contractions (i.e., surpluses) are associated with a significant increase in investment share, as expected, but there is no sign of the "crowding out" effects of fiscal expansions. Fiscal expansions are, however, associated with a fall in the net export share, consistent with the "twin deficits" view. But oddly enough, falling net exports also seem to have accompanied fiscal contractions. This last result is no doubt driven by the 1994–2000, a period of both record fiscal surpluses and record trade deficits (an apparent contradiction of the "twin deficits" theory).

4.3 Does the Fed respond to fiscal policy?

Even leaving aside more exotic considerations, such as strategic interactions or fiscal dominance, there are two straightforward reasons why one might observe a systematic relationship between fiscal and monetary policy. One is that fiscal expansions tend to lead to more rapid GDP growth in the future, which would be taken into account in setting monetary policy. A second reason is, as noted by Taylor (1995), that heavy government borrowing tends to drive up the equilibrium real interest rate. The results presented in this section confirm that fiscal policy does indeed affect future output, but there is little evidence to indicate that the Federal Reserve has responded to fiscal policy *independent* of its effect on GDP.

An sensible way to model the relationship between monetary policy and macroeconomic conditions is by way of a reaction function of the form proposed by Clarida et al. (2000), in which the target interest rate depends on expectations of future inflation and the output gap,

$$i_t^* = i^* + \beta(E_t\pi_{t,k} - \pi^*) + \gamma E_t x_{t,q} \tag{8}$$

where $\pi_{t,k}$ is the rate of inflation from period t to period $t+k$, π^* is the target inflation rate, and x_{t+q} is the output gap in period $t+q$. The i^* represents the nominal target that would be set with inflation equal to its target and no output gap, which is in turn equal the equilibrium *real* rate of interest, r^*, plus the target inflation rate. Policy at time t is set on the basis of expectations formed at that time, hence the E_t conditional expectation operators. Since most central banks seem to exhibit a preference for gradual adjustments in interest rates, Clarida et al. append a partial adjustment mechanism,

$$i_t = \rho i_{t-1} + (1-\rho) i_t^* \tag{9}$$

in which a higher value for ρ implies more gradual adjustment towards the target. Combining equations 8 with 9 yields

$$i_t = (1-\rho)\left[r^* - (\beta-1)\pi^* + \beta(E_t\pi_{t,k} - \pi^*) + \gamma E_t x_{t,q}\right] \tag{10}$$

which is amenable to estimation via Generalized Method of Moments.

The (exogenous) stance of fiscal policy could enter the reaction function in one of two ways. One way is through its effects on expected future inflation and the future expected output gap. In this case, fiscal variables would be useful information variables for the monetary authority, and represent valid instruments for the econometrician in estimating the reaction function. The second way in which fiscal policy might enter is through its effect on the equilibrium real interest rate, r^*. In this case, fiscal policy would affect the interest rate *independent of* its effects on expectations of output and inflation.

The first empirical question therefore, is the effect of fiscal policy on expected future GDP and/or inflation. Since the issue is merely one of forecasting, rather than structural modeling, it is amenable to simple tests of Granger causality, the results of which are shown in table 3. Two specifications are considered: a bivariate model with real GDP growth and the relevant fiscal variable, and a four-variable model that also includes the Fed funds rate and the inflation rate. Both are estimated on quarterly data spanning 1960Q2 through 2002Q2, using a variety of measures of fiscal policy: the unadjusted fiscal surplus, the structural primary surplus (as estimated by the Congressional Budget Office), real growth in government expenditures, and real growth in military spending.

The results in table 3 show that fiscal policy (at least as measured by the overall fiscal balance) is informative about future GDP growth: the surplus and the primary structural balance are both significant at the 0.10 level or better in both specifications. The balance is uninformative about future inflation, however. Neither of the two spending growth measures seems to predict either real GDP or inflation. None of the fiscal measures Granger-causes the Federal funds rate.

The next logical question is then whether fiscal policy has an effect on the Federal funds rate independent of its impact on future GDP growth. This question can be addressed by simply including the fiscal stance as a separate regressor in equation 10,

Table 3: Tests of causality from fiscal to macro variables

	Bivariate	Four-variable		
Fiscal variable	GDP	GDP	Inflation	Funds rate
Surplus	0.07	0.07	0.28	0.19
Struct. prim. bal.	0.02	0.06	0.59	0.24
Gov. expenditures	0.99	0.99	0.65	0.62
Military spending	0.91	0.89	0.82	0.89

Notes: Numbers are the p-values for the exclusion of the fiscal variable from the relevant equation in a four-lag VAR estimated over the 1960Q2 to 2002Q2 sample. The bivariate VAR includes real GDP growth and the fiscal variable. The four-variable VAR includes real GDP growth, the Federal funds rate, and inflation, as measured by the deflator for personal consumption expenditures, excluding food and energy. The surplus and structural primary balance are expressed as a percentage of nominal income, while government expenditures and military expenditures are expressed as real growth rates.

while also including it in the instrument set. The results of this exercise appear in table 4.

The first line of the table reports the estimate of equation 10 as in Clarida et al. (2000), with $k = 4$ and $q = 1$ for the full 1960–2002 sample. The fiscal stance (the primary structural budget balance) is included in the instrument set, but not included as a regressor. The results are quite similar to theirs, with an implied β slightly in excess of 2, and an implied γ near unity.[24] The second line includes the primary structural budget balance as an additional regressor, to test for any independent effect of fiscal policy on the funds rate target. No such effect is apparent: the coefficient is small, statistically insignificant, and has the "wrong" sign (in the sense that a surplus is associated with higher interest rates).

The remaining lines in the table report the results for different specifications, sample periods, and choice of fiscal variable, but in no case is there any evidence that the Fed responds directly to fiscal deficits with higher interest rates. The coefficients on the

[24]The implied β and γ are backed out by dividing the coefficients on inflation and output by 1 minus the coefficient on the lagged funds rate.

Table 4: The (non) response of monetary policy to fiscal policy

		Regressors:						
Model	Sample	con-stant	infla-tion	GDP gap	lagged FFR	fiscal bal.	F+	F–
For-ward	Full	-0.04	0.20	0.10	0.89			
		(0.23)	(3.52)	(2.34)	(25.7)			
For-ward	Full	-0.11	0.22	0.10	0.88	0.09		
		(0.61)	(3.26)	(2.41)	(22.5)	(1.35)		
For-ward	Full	-0.24	0.27	0.08	0.87		0.10	0.53
		(1.30)	(3.72)	(1.84)	(20.2)		(0.43)	(3.33)
Back-ward	Full	-0.03	0.18	0.16	0.90	0.03		
		(0.20)	(1.91)	(4.96)	(22.0)	(0.37)		
For-ward	1979–2002	0.00	0.45	0.12	0.80			
		(0.00)	(3.33)	(2.28)	(14.2)			
For-ward	1979–2002	-0.16	0.51	0.07	0.77	0.14		
		(0.42)	(2.90)	(1.11)	(10.7)	(1.15)		

Notes: Numbers in parentheses are t-statistics incorporating the Newey-West correction. The "full" sample runs from 1960Q2 through 2002Q2. The 1979–2002 sample begins in 1979Q4. The fiscal variable is the structural primary budget balance calculated by the Congressional Budget Office. The forward-looking specifications use two lags of the output gap, current and one lag of the year-over-year inflation rate, the lagged funds rate, commodity price inflation, and the fiscal variable as instruments. The F+ and F– dummy variables correspond to the periods of fiscal expansions and contractions in table 1.

fiscal variables are generally insignificant. Only the coefficient on the fiscal contraction dummy variable in the third regression is statistically significant, but taken at face value, the result indicates that fiscal contractions are associated with a 50 basis point *increase* in interest rates. This result can be attributed to the tendency for the reaction function to underpredict the 1994–95 rise in interest rates, which occurred just as the Clinton-era fiscal consolidation was getting under way.

5 Conclusions

At one level, the overall conclusion of this paper is not terribly exciting: fiscal considerations have played a relatively minor role in U.S. monetary policy over the past 40

years. The reasons for this bland conclusion are more interesting, however, and offer lessons of potential relevance to other countries. One reason for fiscal policy's peripheral role in the U.S. is that fiscal dominance has not been a serious issue (at least in the post-WWII era). Consequently, the Federal Reserve has been free to actively pursue its macroeconomic objectives without regard for the needs of government finance. Second, it is hard to find convincing examples of perverse outcomes stemming from coordination failures or strategic interactions. And empirically, there is no evidence of a direct linkage from the fiscal policy stance to monetary policy.

The Federal Reserve is fortunate in being able to conduct policy without fiscal distractions. This is clearly not the case for those countries in which fiscal dominance or conflict between divergent policy goals is a serious issue. The U.S. experience therefore serves as a reminder that while it is surely an important step, legal independence alone is not sufficient to guarantee a sound monetary policy; fiscal conditions are important as well. And in the end, a successful monetary policy will be one in which the monetary-fiscal policy interactions are as uninteresting as they are in the U.S.

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